

## Growing Peas in Montana

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Field peas (*Pisum sativum*) are a major crop produced on over 18 million acres in cooler regions of the world. Peas were among the first domesticated crops, and originated in Southeast Asia.

The dry pea is widely adapted in Montana, and is an excellent protein source for human or livestock consumption. During the 1940s, peas were a major cash crop in several Montana counties, supplying canneries in Bozeman and Red Lodge. Unfortunately, due to severe disease outbreaks, pea production all but disappeared in Montana for over 40 years. Pea production has steadily risen in the Pacific Northwest and Canada, with current acreage exceeding two million acres. Field peas are being rediscovered in Montana as an alternative crop, and acreage is now approaching 80,000 acres.

Field peas are a good seed crop, provide excellent forage in mixtures with small grains, and can be used as a green manure crop. Because of its versatility and wide adaptation, Montana producers should consider the use of field peas in their cropping systems.

### Types and Uses of Peas

Field peas are an annual legume that grow from two to five feet high. Leaves consist of up to three pairs of leaflets with a terminal tendrils. At maturity, pea vines are usually prostrate, unless planted with a small grain.

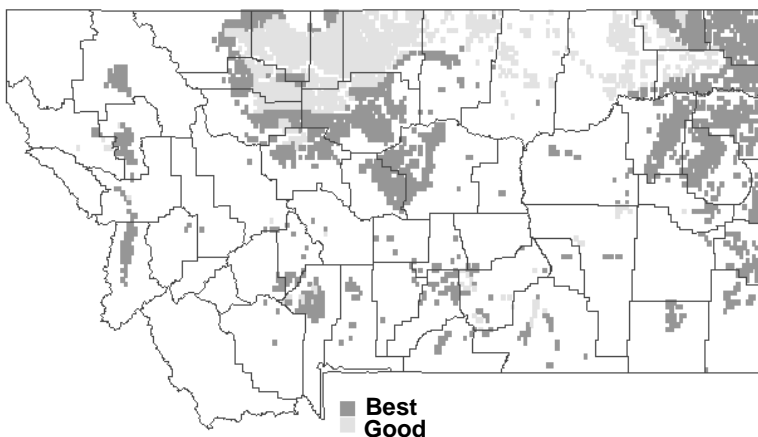
Indeterminate (climbing) peas continually bloom throughout the summer until temperatures and moisture become limiting. Determinate (bush) peas are generally

dwarf types, have a shorter flowering period, and mature earlier.

Peas are predominately self-pollinated, resulting in pods about three inches long containing four to nine seeds.

Most major garden, feed, or processing peas belong to the subspecies *P. sativum* spp. *hortense*. This group generally has white flowers, and nonpigmented pods and seeds. Austrian winter peas and maple peas generally have

### Areas With Pea Production Potential



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pigmented flowers, pods, and seeds, and belong to the subspecies *P. sativum* spp. *arvense*.

Most field pea varieties are classified by criteria such as growth habit, leaf type, and the color, size and shape of seed. There are several types—garden, edible pod vegetable, processor, feed, or forage peas. Growers should select pea varieties based on intended use or market.

Both green and yellow peas are used for human consumption for **canning, soup**, and as ingredients in **food processing** as well as **live-stock feed**.

### ***Growing Peas for the Food Industry***

Peas are an excellent source of dietary protein, and pea flour is an important component in the food industry.

Dry peas destined for the food market have rigid quality control standards. Major pea markets for human consumption are countries in the Caribbean and Central America, South America, Western Europe and Southeast Asia.

### ***Peas as a Forage Crop***

The current major use of field peas in Montana is as an annual forage crop. Peas grown in a mixture with barley, oat, triticale, or wheat are highly productive and nutritious. The addition of field peas to small grain hay slightly improves forage yield under both dryland and irrigated conditions, but significantly improves protein and relative feed value.

Field peas are an excellent nitrogen-fixing crop, and have great potential as a green manure crop in lieu of fallow in traditional crop-fallow rotations. Pea forage and roots at maturity consist of about 2.5% nitrogen (N), and depending on biomass production, can leave

over 30 pounds of N per acre after seed harvest under dryland conditions. Peas or other legume crops planted in lieu of fallow and terminated by mid-season based on summer moisture (“flexible green manure crop”), can return over 80 pounds of N per acre to the soil.

Recent research by the Montana Agricultural Experiment Station (MAES) has indicated that with proper management based on monitoring rainfall and soil water, peas or other legumes can fix a significant amount of N with little difference in stored moisture compared to fallow.

### ***Peas as a Livestock Feed***

A growing use of field peas is for livestock feed. Field peas have high levels of tryptophan and lysine, essential amino acids normally deficient in small grains. Peas are an excellent protein supplement for all classes of livestock, including poultry and other birds.

Several research trials have demonstrated that field peas can be a partial or complete replacement for soybean meal in cattle, lamb, and swine rations.

Field peas have about 25 percent protein (as compared to 44 percent for soybean meal), and a similar amino acid profile to soybeans. But unlike soybeans, field peas do not require heat processing to overcome trypsin inhibitors and other antinutritional factors. Therefore, peas have a large potential in Montana for growers desiring to produce home-grown protein supplements.

Although no feeding trials have been conducted in Montana, several producers have used whole peas or pea screenings for cattle, sheep or hog feed. Until further research is conducted, the concen-

tration of peas in livestock rations must not be too high because of lectins, proteases and tannins which might potentially cause nutritional problems.

### **Field Pea Culture**

Peas are a cool-season crop, and optimum production occurs in areas where mean daily temperatures are 55° to 65°F. Peas are adapted to all soil types but perform best on well-drained soils with pH of 5.9 to 6.5 (see *Reference 4*), but can be grown on soils up to pH of 7.5.

Peas should be inoculated prior to planting with *Rhizobium leguminosarium* (see *Inoculating Legumes*, MontGuide 9114). Seed treatments are often used to control seedling diseases. The labels should be checked carefully to ensure that these products do not impede nodulation.

In Montana, peas can be seeded in the spring as early as small grains. At soil temperatures of 40, 50 or 60°F, emergence of peas requires about five, two or one week(s), respectively (see *Reference 2*). Seeding should occur as early as possible when temperatures in the top one inch of soil exceed 40°F (late March through April) to capitalize on spring moisture. The pea seedling can tolerate moderate frosts, and in many cases new shoots will emerge from nodes below the soil surface when the main shoot is killed.

### ***Austrian Winter Pea***

One exception to spring seeding is the Austrian winter pea (AWP), which appears to have winter-hardiness similar to winter barley. The AWP may be seeded in the fall when chances of snow cover are good, or in the spring (see *Reference 3*). Although AWP is not

widely recommended for fall seed-  
ing in northern areas, several  
Montana producers have success-  
fully planted AWP in the fall for  
subsequent spring forage or a seed  
crop.

In many areas, AWP could  
likely be grown in a mixture with  
winter wheat or triticale for snow-  
trapping and protection. In dryland  
conditions, AWP-small grain mix-  
tures are suitable for forage be-  
cause they utilize snow and spring  
moisture to produce high yields  
earlier than spring-seeded annual  
forages. In areas of high precipita-  
tion, spring peas typically produce  
higher forage yields than AWP.

### **Planting Field Peas**

Field peas should be planted in  
a firm, well-prepared seedbed,  
with minimal crop debris and no  
large clods. For seed or forage  
production, the field should also  
be free of rocks. Peas require fer-  
tilizer rates of phosphorus (P) and  
potassium (K) similar to annual  
small grain crops for high produc-  
tion of forage or seed (see Table 1  
below). As with other crops, fertil-  
izer application rates should be  
based on a soil test (see *Soil Sam-  
pling*, MontGuide 8602).

Field peas grown on soils with  
less than 20 pounds per acre of  
available N generally benefit from  
the application of 20 to 40 pounds  
of N at seeding. Fertilizer can be

broadcast in the fall or spring dur-  
ing field preparation, or deep  
banded with the seed at planting.  
Pea seedlings are very sensitive to  
salt, and proper fertilizer place-  
ment is critical to avoid injury.

Field peas can be seeded with a  
grain drill in six- to seven-inch  
rows, at a depth of one to 2½  
inches. The drill should be ad-  
justed to provide for uniform flow  
and to prevent seed cracking. Hoe  
drills may be preferable to double  
disc drills because in heavy debris  
or at high speeds some seed will  
not be covered. Although precise  
planting can be achieved with air  
seeders, pea seed may be damaged  
by high air volumes in tight bends  
in the distribution hoses. For pure  
stands of peas for a seed crop, the  
seeding rate should be adjusted to  
place seven viable seeds per  
square foot (see *Reference 4*). Seed  
size varies dramatically in field  
peas—from 1400 to 3500 seeds  
per pound depending on variety  
and growing conditions; therefore  
seeding rates will vary from 80 to  
200 pounds per acre. For small  
grain/pea mixtures, the ideal plant  
population will have 60 to 66 per-  
cent peas, and the seeding rate of  
each crop should be determined  
based on actual seed weights.

Some drills can easily be ad-  
justed for planting small grain/pea  
seed mixtures. However, in many

cases when the flow is adjusted  
properly for the small grain, pea  
seed are cracked. In these cases it  
may be necessary to drill in two  
operations. Ideally the peas are  
seeded in the second pass at an  
angle to the small grain rows.

### **Weed Control**

Weed competition can reduce  
yield of field peas. Severe weed  
infestations should be controlled  
by mechanical or chemical meth-  
ods prior to planting peas. Newer  
crops such as peas and lentils are  
produced on limited acreage in  
Montana, and several herbicides  
available in the Pacific Northwest  
or Western Canada are not labeled  
in Montana. Current herbicides  
labeled for grass control in peas  
include trifluralin (Treflan),  
ethalfluralin (Sonalan),  
sethoxydim (Poast), and triallate  
(Far-Go). Broadleaf herbicides are  
imazethapyr (Pursuit), metribuzin  
(Lexone, Sencor), MCPA, MCPB,  
and bentazon (Basagran). Produc-  
ers should follow all label instruc-  
tions carefully.

Hopefully, as pea acreage ex-  
pands in Montana, effective herbi-  
cides from surrounding states and  
provinces will be labeled for use in  
Montana. As these herbicides be-  
come available, producers should  
refer to the latest version of the  
*Montana, Wyoming, and Utah  
Weed Control Handbook*, which is  
published annually, and is avail-  
able from the Extension Publica-  
tions Office at MSU-Bozeman:  
(406) 994-3273.

The use of field peas in small  
grain rotations offers producers an  
excellent opportunity for weed  
control by selection of alternative  
herbicides. For example,  
quackgrass or wild oat can be con-  
trolled during the pea rotation.  
Additionally, field peas or small

**Table 1. Field pea fertilizer recommendations for Montana.**

Phosphorous (P)		Potassium (K)	
Soil Test Level (ppm)	Apply (P <sub>2</sub> O <sub>5</sub> ) (lb/A)	Soil Test Level (ppm)	Apply K <sub>2</sub> O (lb/A)
>15	0-20	200	0-15
9-15	30	150	35
<9	40	100	55
		<50	75

grain/pea mixtures produced for forage under high rainfall or irrigated conditions are very effective “smother” crops. These crops are very competitive for nutrients and moisture, and generally restrict weed growth. When harvested for silage or hay, many weeds under the crop canopy are unthrifty and produce fewer seeds.

In green manure systems, many annual weeds are immature at the time the pea crop is terminated by mechanical or chemical methods (several nonselective herbicides are labeled for chemical fallowing). These features of field peas have been noted by producers, but no long-term crop rotation studies have quantified the effects of peas on weed populations in different cropping systems.

## Field Pea Diseases

Several diseases can severely reduce establishment and production of field peas. The major diseases of field peas in Montana are **seed rot**, **root rot**, and **blights of**

## the stem, leaf or pod.

Seed rots are soil-borne fungal diseases caused by *Fusarium solani*, *Pythium* spp. or *Rhizoctonia solani*. During germination, seedlings are infected and fail to emerge or grow. Fungicide treatments such as Thiram, Captan, or Apron are cost-effective control measures, and do not interfere with nodulation. Other products are available, and producers are encouraged to read and follow label instructions carefully.

Fusarium root rot is favored by warm, dry soils, excessive compaction, or low fertility. Infection of young seedlings is usually lethal, but foliar symptoms may not be detected until plants become stunted or yellow. The vascular system of the stem or root of infected plants becomes red or brown. Infected plants in dry areas of a field may fully develop and set pods; however, they will be premature and lower yielding.

Crop rotation of at least four years is recommended to control

losses to Fusarium. Fusarium wilt, caused by *F. oxysporum* destroyed Montana’s pea industry in the 1940’s, most likely due to poor sanitation and continuous cropping of peas. Good resistance to Fusarium wilt is available if needed. Check with the MSU Extension Service for a list of resistant varieties.

Aschocyta blight is a seed-borne disease that causes purplish-black streaks or lesions on leaves, stems, or pods. Control measures include the use of clean seed, elimination of crop debris, and crop rotation.

Pea mosaic is a virus that is vectored by the pea aphid. Other pea diseases include Septoria blight, bacterial blight, powdery mildew and downy mildew.

For most of these diseases, the only available control measure is to exclude the pathogens and avoid conditions favorable for disease spread. Since peas are a relatively new crop in Montana, producers are encouraged to use high quality

**Table 2. Forage and protein yields of barley, oat and Austrian winter pea (AWP) at Kalispell, MT during 1978 and 1979.\***

	Dryland			Irrigated			Average		
	Tons DM/A	% Protein	Pounds Protein/A	Tons DM/A	% Protein	Pounds Protein/A	Tons DM/A	% Protein	Pounds Protein/A
Barley	1.87 <sup>1</sup>	7.5	281	2.62	7.3	378	2.24	7.4	330
AWP	1.51	18.3	550	1.66	18.9	621	1.58	18.6	586
Barley + AWP	2.06	10.4	410	3.02	12.8	768	2.54	11.6	589
Oat	2.24	6.2	257	3.68	6.3	469	2.96	6.3	363
AWP	1.49	16.7	498	2.16	17.6	759	1.82	17.2	628
Oat + AWP	2.37	9.5	401	3.31	9.7	616	2.84	9.6	509

\*Adapted from Welty, L.E. (1984). Small grain-annual legume mixtures evaluation for forage production. Montana AgResearch 1:5-9.

<sup>1</sup>Otana’ oat, ‘Ridawn’ barley, and ‘Fenn’ AWP seeding rates were 56, 76, and 117 pounds pure live seed per acre (PLS) seeded alone, and 34, 46, and 82 pounds PLS per acre in mixtures. <sup>1</sup>Table values are the averages across 1978 and 1979.

seed produced in disease-free areas, incorporate crop residues and use prudent rotations.

Spring field peas generally require the same growing season as spring wheat. Bloom generally occurs about 60 days after seeding in Montana, and maturity occurs at about 90 days. High temperatures during flowering (>90°F) can cause flowers to blast, and reduces seed yield. Peas respond to moisture similar to wheat, requiring good moisture at emergence until bloom, then dry, warm weather for pod filling and ripening.

### **Variety Recommendations**

Although several field pea varieties have been extensively evaluated for potential seed or forage production in Montana, none have been processed through the Montana Agricultural Experiment Station (MAES) recommendation procedure.

As the popularity of peas and other alternative crops expands, it is likely that more research efforts can be devoted to these crops. Most pea varieties discussed in this MontGuide are readily available in Montana, and this information provides the potential productivity of field peas in Montana.

### **Harvesting Field Peas for Forage**

Field peas are an excellent alternative forage. Several producers in eastern Montana have utilized fall-planted Austrian winter peas or pea/winter wheat mixtures for early grazing for cattle or sheep. Stands of pure peas can be used for emergency grazing or silage, but are unsuitable for dry hay production. Currently, the most common use of field peas in Montana is in spring-seeded mixtures with

small grains for hay.

Hay barley or oats are widely adapted annual forage crops throughout the U.S. In Montana, these crops can routinely produce 2.5 to 3.5 tons of dry hay per acre under irrigated conditions and 1.0 to 2.5 tons on dryland.

In the late 1970s, oats, barley and Austrian winter peas were evaluated alone and in mixtures for forage yield and protein at Kalispell (see Table 2). Over a two-year period, under both irrigated and dryland conditions, oats or oat-pea mixtures were the highest yielding forages. The addition of peas increased forage yield of barley by 14 percent, but slightly reduced oat yield.

However, the major benefit of adding peas to small grain forages was the increase in protein content and protein harvested per acre. Adding peas increased protein yield per acre of the barley mixture by 78 percent and the oat mixture by 40 percent.

Obviously the final quality of pea/small grain hay will depend on the actual composition of peas in the mixture, maturity stage of each crop at harvest, and weather and haying conditions.

In Montana, preferable mixes would consist of hay barley ('Haybet' or 'Westford') or late-maturing oat (e.g., 'Otana'), plus AWP or other feed peas. In the limited research trials conducted by the MAES, AWP has been shown to be excellent in spring mixtures with oats or barley. Many producers have successfully used 'Trapper,' 'Sirius,' and even a determinate yellow feed pea variety—'Miranda'—which has an upright growth habit enabling easier harvest. Although no research data are available, several

producers have used other winter cereals such as triticale or spelt mixtures with Austrian winter peas for either fall or spring seedings. The current recommendation for timing of harvest is to cut when the small grain is in the milk to soft dough stage to optimize hay tonnage and quality.

Field drying rate of small grain/pea hay is often several days slower than barley or oat hay alone, and this depends on the pea composition in the mixture. Although grain-pea hay dries slower than other crops, leaf loss during raking, turning, or baling appears to be less severe than alfalfa. Round balers can routinely be used to bale good quality pea/small grain hay, often as well as alfalfa hay.

In several Midwestern states, oat-pea mixtures are recommended as nurse crops for alfalfa. However, in Montana this practice is not advised, based on poor stands and long-term poor performance of alfalfa seeded under small grains. Producers who require a nurse crop should use low seeding rates and wide row spacings of oat or barley to optimize alfalfa establishment. Producers who would consider planting irrigated small grain/pea mixtures as a nurse crop, are advised to consider other options.

One scenario would be seeding the pea/small grain hay as early as possible, followed by early haying, tillage, seedbed preparation, direct seeding alfalfa during the first week of August, and irrigating to ensure adequate stand and growth going into winter. Obviously, pea/small grain hays offer considerable flexibility for both annual and perennial forage systems, and their uses will continue to increase.

## Harvesting Dry Peas

Field peas require a growing season of 85 to 110 days, depending on variety, seeding date, precipitation, and heat units. Harvest should be based on crop maturity and seed moisture. The older, bottom pods mature first, and the crop is at physiological maturity when all pods are yellow to tan. Producers should monitor several representative areas of the field and check maturity of the bottom, middle, and top pods. During hot, dry weather, peas mature very rapidly. Under ideal conditions, harvest of determinate varieties should occur when the bottom peas rattle in the tan to brown pods, the middle and top pods are yellow to tan and the seeds are firm and shrunken.

In indeterminate varieties such as Austrian winter peas or under moist conditions, the top pods will be less mature and fully expanded. However, harvest should occur before significant shattering of lower pods.

In Montana, peas are harvested by direct combining, or swathing

and combining. In surrounding states and provinces, chemical desiccants are used to uniformly kill pea vines before harvest. At this time no desiccants are labeled for peas in Montana.

In hotter years, most determinate field peas can be direct combined in Montana; however, with indeterminate varieties, or under cool, moist conditions, swathing is advisable. Swathing is done when most of the pods and vines have turned yellow to tan in color. Up to one-third of the vines or pods may still be light green, but these will mature with limited seed shrinking in the swath. At this stage, most seeds will be difficult to dent with the thumbnail.

When most of the field is ready for swathing, producers should swath the entire field, even though plants in scattered low areas remain green. The yield and quality of the majority of the pea crop should not be jeopardized by delaying harvest for the low areas of the field to mature.

Lodging will occur in most pea crops before harvest, and swathing

or combining operations should occur at a 90-degree angle to the direction the crop is lodged. Swathing should occur with a dew to prevent shattering.

Short pea crops that have most of their pods near the ground are best swathed when partially green in order for the pickup reel to lift the crop with minimal shattering. If these crops mature while standing, there may be insufficient vine material to lift the crop above the ground without severe shatter loss.

Heavy, long-vined crops are best handled by taking a narrow cut where wind is prevalent. The swath should be rolled to prevent wind damage to dry, fluffy windrows.

If the crop was mostly mature, and weather conditions are favorable for immediate combining, the ideal swath will be wide and uniform to promote fast drying.

Field peas can be combined when seed moisture is less than 20 percent. Combining at too low a moisture content will cause high cracking and splitting losses which will result in downgrading for seed

**Table 3. Seed Yields of Dryland Spring-Seeded Peas in Montana.\***

	Austrian Winter Pea	'Miranda' Pea	'Sirius' Pea	'Trapper' Pea
	lb/A			
Bozeman	2082	1605	2027	1356
Conrad	2445	1736	1666	2659
Denton	1344	2368	2960	1632
Havre	—	2040	2088	1385
Highwood	1312	3584	1888	1312
Kalispell	—	—	2389	2507
Moccasin	—	978	—	1746
Sidney	—	1703	1747	1230
Average	1952	2002	2099	1988

\*Mean performance in statewide trials (1989-1991) and Western Regional Pea Nursery at Kalispell (1988-1992).

or food markets. Combining at too high a moisture content will increase combine power requirement and result in plugging and wrapping problems, plus the crop will require immediate aeration or drying. Very low cylinder speeds (350 to 600 rpm) should be used to reduce splitting (*see References 1 and 4*). Concave settings should be about 0.6 inch, and if the crop is very dry the concaves can be removed or lowered to reduce splitting.

Ideal threshing and separation occurs when the crop is at about 16 percent seed moisture and with uniform pickup speed and proper cylinder speed. The combine should be operated at full capacity to reduce seed damage in the cylinder and grain elevators. Augers and loaders should be operated at slow speed to minimize seed damage.

For safe storage, pea moisture content should be 15 percent or less. New specialized machinery for swathing and combining field peas is rapidly becoming available in large production areas such as Western Canada and the Pacific Northwest. Inexpensive, spring-loaded vine lifters can be easily attached to cutter bars of swathers or combines to improve harvesting lodged pea vines. Pickup reels with modified fingers or vine lifters can also be adapted for both swathers and combines. Montana producers are encouraged to examine new equipment and products available in other regions that have greatly improved harvest efficiency of field peas.

## Yield

Field pea yields in Montana research trials have ranged from 900 to 3500 pounds per acre (see

Table 3). Across diverse dryland locations, pea yields were about 2000 pounds per acre. Several growers in the Madison and Shields Valleys have produced over 3000 pounds per acre under irrigation or high rainfall.

Since 1987, market prices for field peas in the Pacific Northwest have ranged from \$5.50 to over \$11.00 per hundred weight (FOB warehouse), indicating potential gross returns of \$82.50 to \$165.00 for dryland peas that produced 1500 pounds per acre.

## Summary

Field peas are a promising crop for Montana producers to consider growing for forage, seed, or green manure. Peas are widely adapted throughout Montana, and appear to be an excellent alternative crop. Acreage of peas has expanded in surrounding states and provinces, and the marketability of this crop is improving in Montana. Peas are a very flexible crop, and as producers alter their cropping systems to reduce inputs or adjust to farm program changes, field peas should be considered. Interested producers should contact their local Extension Service Agent or agronomists at Montana State University for additional information on pea production in Montana.

## References and Resources

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4. Pulse production manual. 1993. 178 pp. Alberta Pulse Growers Commission, 5030-50th Street, Lacombe, Alberta, Canada T4L 1W8.

Montana Dry Pea and Lentil Growers Association. Annual conference, newsletters, field tours. P.O. Box 1, Wilsall, MT 59086.

Pulse Crop News. Quarterly publication produced by Alberta Pulse Growers Association, P.O. Box 624, Lacombe, Alberta, Canada T0C 1S0.

U.S.A. Dry Pea and Lentil Council, 5071 Highway 8 West, Moscow, Idaho 83843.

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